

Memorandum of Understanding

Between

Fermi National Accelerator Laboratory

And

Lawrence Livermore National Laboratory

for the E907 Experiment

FY2002-2004

Version 0.8

December 14, 2001

I. Preamble

This memorandum describes an Understanding between the Fermi National Accelerator Laboratory (Fermilab) and Lawrence Livermore National Laboratory (Livermore) concerning the design, construction and installation of the E907 Experiment.

In broad terms, the E907 Experiment consists of two parts: the Beam, primary and secondary particle beams derived from Main Injector slow extracted 120 GeV/c protons, as specified in the E907 Proposal; and the Experiment, an open geometry spectrometer with broad acceptance and nearly complete particle identification capability. (In this document, the capitalized words “Beam” and “Experiment” refer to the two parts of the E907 Experiment, while the phrase “E907 Experiment” refers to the Beam and the Experiment as a whole.) The E907 Experiment is described in greater detail elsewhere (*e.g.*, the E907 Proposal and Proposal Addendum).

This document represents an understanding between Fermilab and Livermore concerning their anticipated long-term contributions and responsibilities in connection with the design, construction, and operation of the E907 Experiment. It is understood that the anticipated responsibilities and contributions of each institution may later be modified or that additional responsibilities may be added to those described here. It does not constitute a legal contractual obligation on the part of either of the parties. It reflects an arrangement that is currently satisfactory to the parties involved. The parties agree to negotiate amendments to this memorandum as required to meet the evolving requirements of the E907 Experiment design and construction program.

Periodic amendments to this Memorandum of Understanding (annual Statements of Work) will detail the contributions of each institution as the experiment construction proceeds and will contain the specific activities, deliverables and funding required. The normal period of performance will be the U.S. fiscal year (October 1-September 30).

II. Major Areas of Responsibility

In broad terms, Livermore has major responsibility for funding and coordinating construction of the Experiment, and Fermilab has major responsibility for funding and constructing the Beam.

Specific areas of responsibility are detailed in the following two subsections:

A. Livermore Areas of Responsibility

Livermore has major responsibility in the following areas:

1. Facilitate the design of the E907 Experiment by the E907 Collaboration.
2. In concert with the E907 Collaboration and Fermilab, develop the detailed construction plan and Statements of Work for the E907 Experiment.

3. Support Fermilab personnel in the design and construction of the Beam.
4. Commit and transfer funds (the Livermore Funds) to Fermilab to fund construction of the Experiment based on the annual budget allocated to the E907 Experiment by Livermore. This is expected to be approximately \$500K per year for the two main construction years (FY2002–FY2003). This expectation is based on the E907 Cost and Schedule Plan.
5. In concert with the E907 Collaboration support Fermilab personnel in the construction of the Experiment.
6. In concert with the E907 Collaboration provide progress and status reports on the E907 Experiment as requested by the Fermilab Director, *e.g.*, to the Fermilab Physics Advisory Committee.

B. Fermilab Areas of Responsibility

Fermilab has major responsibility in the following areas:

1. Recommission slow extraction from the Main Injector.
2. Complete the installation and commissioning of Main Injector beams to the Meson Detector Building.
3. Allocate a modest number of Main Injector shifts to establish the double slow spill extraction mode.
4. Install the E907 Beam line.
5. Commission the E907 Beam line in MC5 and MC6.
6. Assist the E907 Collaboration in the construction of the Experiment in MC7 by assigning necessary people and institutional services, paid for by the Livermore Funds, as called for in the E907 Cost and Schedule Plan.
7. Assist the E907 Collaboration in the construction of the Experiment in MC7 by providing 250 effort days of engineering in FY2002, paid for by Fermilab.
8. Deliver sufficient protons to the primary target to accomplish at least 7 “data points” in a pure test beam mode or 26 “data points” in the event of the double slow spill scheme being made operational. A “data point “ is defined in the E907 proposal document. The 7 “data points” will enable E907 to accomplish all its goals with reduced statistics.
9. Make available computing services, data storage and compute cycles for analysis as well as existing PREP electronics to facilitate the acquisition of data in E907.

It is understood that items B 1 and B 2 above are being executed by Fermilab to deliver test beam to the Meson Test beam line in FY2002; they are listed here because they are also essential for running the E907 Experiment.

Item B 3 will increase beam availability to E907 (and the test beam) by approximately an order of magnitude, enabling the completion of the full E907 run plan. If for technical reasons (*e.g.*, the double slow spill extraction mode can not be made to work) Fermilab is unable to deliver the full beam request, it is understood that Fermilab intends to deliver at least sufficient protons to enable E907 to accomplish its physics goals with reduced statistics, as stated in item B 8.

Item B 8 notwithstanding, it is understood that it is the intention of Fermilab to deliver sufficient protons for the E907 Collaboration to accomplish the complete E907 run plan.

The above items will be entered into in more detail in a separate MOU between Fermilab and E907.

III. General Considerations

A. Safety and Engineering Practices

All experimenters are expected to comply with the requirements of the Fermilab ES&H Manual. The experimenters from Livermore agree to familiarize themselves with Fermilab safety policies and to adhere to them.

All detector components must be designed, fabricated, installed and operated in conformity with Fermilab safety policies and practices as well as Fermilab engineering standards. All major components will undergo appropriate Fermilab design, safety, and engineering reviews.

The Fermilab Radiological Control Manual is a part of the Fermilab ES&H Manual. The experimenters from Livermore are reminded that they may not bring to or take from Fermilab any radioactive materials, including sealed radioactive sources or detectors that contain such sources, without appropriate prior authorization. This authorization must be given in writing, for each item, from the head of the Fermilab Environment, Safety and Health Section.

B. Component Ownership

All items purchased or fabricated with Livermore Funds will become the property of Fermilab. A Fermilab property tag shall identify any item owned by Fermilab that is installed as part of an E907 detector. Such items shall remain part of the detector until such time as the detector is decommissioned or the element is replaced.

C. Schedule and Milestones

The E907 Cost and Schedule Plan contains the detailed schedule for designing, installing, and operating E907. The top-level schedule is as follows:

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| 1. Commence Beam construction | December 2001 |
| 2. Transfer FY2002 Livermore Funds to Fermilab | January 2002 |
| 3. Commence Experiment construction | January 2002 |
| 4. Engineering run with beam | September 2002 |
| 5. Transfer FY2003 Livermore Funds to Fermilab | October 2002 |
| 6. Complete Experiment Construction | March 2003 |
| 7. Commence operations | March 2003 |
| 8. Conclusion of operations | NuMI turn on, expected November 2004 |

Fermilab and Livermore will make every effort to carry out their institutional responsibilities consistent with the E907 Cost and Schedule Plan. These schedules may have to be changed as the project progresses. Changes will be noted in Amendments to the Statements of Work and/or to this Understanding. The Project Managers will define reporting requirements change control procedures for schedule delays.

D. Change Orders and Contingency

The E907 Cost and Schedule Plan contains the detailed work plan (Work Breakdown Structure, WBS), cost estimate, and estimate basis for designing, installing, and operating E907.

It is understood that the E907 Cost and Schedule Plan contains no contingency, and the anticipated Livermore funding profile, \$500K per year, can not be changed significantly. Any cost overruns will result directly in a delay in completing installation of E907.

Fermilab and Livermore will make every effort to carry out their institutional responsibilities consistent with the cost estimate.

The work plan and estimate may have to be changed as the project progresses. Changes will be noted in Amendments to the Statements of Work and/or to this Understanding. The Project Managers will define reporting requirements and change control procedures for cost overruns.

E. Amendments and Modifications

These terms will be updated as appropriate in Amendments to this Understanding.

Periodic amendments to this Understanding (annual Statements of Work) will detail the contributions of each institution as the experiment construction proceeds and will contain the specific activities, deliverables and funding required.

IV. Logistics

A. Personnel

The present Livermore contact person for execution of the E907 Experiment is Edward P. Hartouni. The present Livermore Project Manager for execution of the E907 Experiment is Peter D. Barnes., Jr. The present Livermore Resource Analyst is Tracy Baldwin.

The present Fermilab contact person for execution of the E907 Experiment is Rajendran Raja. The present Fermilab Project Manager for execution of the E907 Experiment is Leon Beverly. The present Fermilab Resource Analyst is Ellie Arroyo.

B. Deliverables

Specific deliverables for each fiscal year, within the Major Areas of Responsibility, will be part of the Statements of Work.

Engineering drawings and other designed items along with written descriptions of their specifications, intended method of operation and test procedures and results will be made available to the E907 Collaboration at the time of their completion.

C. Institutional Contribution of Services and Equipment

1. Services

It is understood that the services of the Fermilab and Livermore Purchasing, Expediting, and Receiving Departments and the Administration Staff will be available to the degree required to carry out the responsibilities of this Understanding.

2. Facilities and Equipment

It is understood that the Fermilab and Livermore electronics shops, machine shops, cranes, and other facilities and equipment will be made available to the degree necessary to carry out the responsibilities of this Understanding.

3. Operating Costs

Fermilab and Livermore, subject to adequate funding from the DOE, will support the normal research operating expenses (such as physicists' salaries, project managers' salaries, physicist travel expenses, miscellaneous supplies, administrative support, *etc.*) of their respective groups working on the E907 Experiment.

D. Specific Fermilab Resources Required

1. Space

The E907 Experiment will be located in the Meson Center beam line, extending from MC5 through MC7, and associated service areas (*e.g.*, counting house).

2. Manpower

Fermilab will assign sufficient manpower with the required skills to complete the tasks agreed upon in the Statements of Work within the fiscal year.

E. Cost and Funding

Total funding required from Livermore is approximately \$1,000K.

Funds will be transferred from Livermore to Fermilab by Integrated Contractor Order.

Fermilab physicist effort may not be charged to the Livermore Funds. Engineer, designer, and technician effort expended on the Experiment can be charged to Livermore Funds.

1. Method of Funding

Livermore shall commit funds to Fermilab based on the Livermore budget allocated to the E907 Experiment for the duration of the E907 Experiment. The Livermore Project Manager has the final authority over such expenditures as well as the obligation to monitor and control costs related to the project. The Livermore Project Manager may redirect funds in the event of funding shortages, project delays, or cost overruns. Fermilab shall make every effort to minimize the cost of the items procured under the terms of this memorandum insofar as it is consistent with the technical requirements of the project.

2. Procurement Authorization

Item purchases exceeding \$10K must be authorized by the Livermore Project Manager

3. Cost Reporting

Fermilab will invoice Livermore for all expenditures and labor charges paid from Livermore Funds on a monthly basis. The Fermilab Project Manager will report the associated technical progress on execution of the Statements of Work on a monthly basis to the Livermore Project Manager, at the level of the tasks specified in the Statements of Work.

4. Recharge Rates and Overhead

Estimated Fermilab labor recharge rates are shown in Table 1. These rates include indirect (overhead) rates of 29% on labor.

The overhead rate on materials and supplies is 16.67%.

Table 1. Estimated Fermilab labor recharge rates, including indirect (overhead) costs.

Resource Type	Recharge Rates (\$ / Day)
Engineer II	\$ 454
Technical Specialist	\$ 394
Senior Technical Aide	\$ 276
Technician II	\$ 233

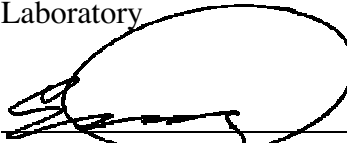
V. Approval

The following concur in the terms of this Memorandum of Understanding.


A. For Livermore

 1/2/02

Peter D. Barnes, Jr. – Livermore Project Manager
HEP Group, N Division, Physics and Advanced Technology, Lawrence Livermore National Laboratory

 1/2/02

Edward P. Hartouni
N Division Leader (Acting), Physics and Advanced Technology, Lawrence Livermore National Laboratory



William H. Goldstein
Associate Director for Physics and Advanced Technology, Lawrence Livermore National Laboratory




C. Bruce Tarter
Director, Lawrence Livermore National Laboratory

APPROVED AS TO LEGAL FORM

 1/2/02
Name Date

B. For the E907 Collaboration

 12/21/01

Rajendran Raja – E907 Spokesman
Particle Physics Division, Fermi National Accelerator Laboratory

C. For Fermilab

 12-20-01

Leon Beverly - Fermilab Project Manager
Fermi National Accelerator Laboratory

 12/21/01

John W. Cooper
Particle Physics Division Head, Fermi National Accelerator Laboratory

 12/17/01

Matthias Kasemann
Computing Division Head, Fermi National Accelerator Laboratory

 12/17/01

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 12/21/01


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Associate Director for Research, Fermi National Accelerator Laboratory

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Kenneth C. Stanfield
Deputy Director, Fermi National Accelerator Laboratory

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Michael S. Witherell
Director, Fermi National Accelerator Laboratory